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Response

Applicant: Niranjan Damera-Venkata et al.

Serial No.: 10/750,591

Filed: December 31, 2003

Docket No.: 200315400-1

Title: DISPLAYING SPATIALLY OFFSET SUBFRAMES WITH A DISPLAY DEVICE HAVING A SET OF DEFECTIVE DISPLAY PIXELS

IN THE CLAIMS

1.(Original) A method of displaying an image with a display device having a set of defective display pixels, the method comprising:

receiving image data for the image;

generating a first sub-frame and a second sub-frame corresponding to the image data;

and

selecting a first position and a second position spatially offset from the first position, the first and the second positions selected based on positions of the defective display pixels and characteristics of a human visual system; and

alternating between displaying the first sub-frame in the first position and displaying the second sub-frame in the second position.

2.(Original) The method of claim 1, and further comprising:

generating a third sub-frame and a fourth sub-frame corresponding to the image data;

selecting a third position spatially offset from the first position and the second position, and a fourth position spatially offset from the first position, the second position, and the third position, the third and the fourth positions selected based on positions of the defective display pixels and characteristics of a human visual system; and

wherein alternating between displaying the first sub-frame and displaying the second sub-frame further includes alternating between displaying the first sub-frame in the first position, displaying the second sub-frame in the second position, displaying the third sub-frame in the third position, and displaying the fourth sub-frame in the fourth position.

3.(Original) ~~The method of claim 1,~~ The method of claim 1, and further comprising:

receiving a second set of image data for a second image;

generating a third sub-frame and a fourth sub-frame corresponding to the second set of image data;

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selecting a third position and a fourth position spatially offset from the third position, the third and the fourth positions selected based on positions of the defective display pixels and characteristics of a human visual system; and
alternating between displaying the third sub-frame in the third position and displaying the fourth sub-frame in the fourth position.

4.(Original) The method of claim 3, wherein the third position is spatially offset from the first position and the second position, and wherein the fourth position is spatially offset from the first position, the second position, and the third position.

5.(Original) The method of claim 1, wherein the first position and the second position are selected from a plurality of allowable positions.

6.(Original) The method of claim 5, and further comprising:
evaluating different combinations of the plurality of allowable positions to identify a combination that minimizes an effect of the defective display pixels on the human visual system.

7.(Original) The method of claim 5, and further comprising:
generating a plurality of sequences of test images, each sequence of test images corresponding to a different combination of the plurality of allowable positions.

8.(Original) The method of claim 7, and further comprising:
filtering each sequence of test images with a spatio-temporal filter based on human visual system (HVS) characteristics.

9.(Original) The method of claim 8, and further comprising:
identifying a sequence of test images from the plurality of sequences of test images that has the smallest impact on the human visual system.

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10.(Original) The method of claim 9, wherein the first position and the second position are positions corresponding to the identified sequence of test images.

11.(Original) A system for displaying an image, the system comprising:

- a buffer adapted to receive a first set of image data for a first image;
- an image processing unit configured to define first and second sub-frames corresponding to the first set of image data; and
- a display device having a set of defective display pixels, the display device adapted to alternately display the first sub-frame in a first position and the second sub-frame in a second position spatially offset from the first position, wherein the first position and the second position are identified based on positions of the defective display pixels and spatio-temporal characteristics of a human visual system.

12.(Original) The system of claim 11, wherein the image processing unit is configured to define a third sub-frame and a fourth sub-frame corresponding to the first set of image data; and

- wherein the display device is configured to alternate between displaying the first sub-frame in the first position, displaying the second sub-frame in the second position, displaying the third sub-frame in a third position spatially offset from the first position and the second position, and displaying the fourth sub-frame in a fourth position spatially offset from the first position, the second position, and the third position, the third and the fourth positions identified based on positions of the defective display pixels and spatio-temporal characteristics of a human visual system.

13.(Original) The system of claim 11, wherein the buffer is adapted to receive a second set of image data for a second image, the image processing unit is configured to define a third sub-frame and a fourth sub-frame corresponding to the second set of image data, and the

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display device is configured to alternate between displaying the third sub-frame in a third position and displaying the fourth sub-frame in a fourth position, the third position and the fourth position identified based on positions of the defective display pixels and spatio-temporal characteristics of a human visual system.

14.(Original) The system of claim 13, wherein the third position is spatially offset from the first position and the second position, and wherein the fourth position is spatially offset from the first position, the second position, and the third position.

15.(Original) The system of claim 11, wherein the first position and the second position are identified from a plurality of allowable positions.

16.(Original) The system of claim 15, wherein the image processing unit is configured to evaluate different combinations of the plurality of allowable positions to identify a combination that minimizes an effect of the defective display pixels on the human visual system.

17.(Original) The system of claim 15, wherein the image processing unit is configured to generate a plurality of sequences of test images, each sequence of test images corresponding to a different combination of the plurality of allowable positions.

18.(Original) The system of claim 17, wherein the image processing unit is configured to filter each sequence of test images with a spatio-temporal filter based on human visual system (HVS) characteristics.

19.(Original) The system of claim 18, wherein the image processing unit is configured to identify a sequence of test images from the plurality of sequences of test images that has the smallest impact on the human visual system.

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20.(Original) The system of claim 19, wherein the first position and the second position are positions corresponding to the identified sequence of test images.

21.(Original) A system for displaying low resolution sub-frames at spatially offset positions to generate the appearance of a high resolution image, the system comprising:

means for receiving high resolution images;

means for generating a plurality of low resolution sub-frames for each high resolution image;

means for displaying the plurality of low resolution sub-frames at a sequence of spatially offset positions, the means for displaying including at least one defective display pixel; and

means for identifying the sequence of spatially offset positions based on a position of the defective display pixel and characteristics of a human visual system to minimize an impact of the defective display pixel on the human visual system.

22.(Original) The system of claim 21, wherein the sequence of spatially offset positions is selected from a plurality of allowable positions.

23.(Original) The system of claim 22, wherein the means for identifying includes means for evaluating different combinations of the plurality of allowable positions to identify a combination that minimizes an impact of the defective display pixel on the human visual system.

24.(Original) The system of claim 22, wherein the means for identifying includes means for generating a plurality of sequences of test images, each sequence of test images corresponding to a different combination of the plurality of allowable positions.

25.(Original) The system of claim 24, wherein the means for identifying includes means for filtering each sequence of test images with a spatio-temporal filter based on human visual system (HVS) characteristics.

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26.(Original) The system of claim 25, wherein the means for identifying includes means for identifying a sequence of test images from the plurality of sequences of test images that has the smallest impact on the human visual system.

27.(Original) The system of claim 26, wherein the identified sequence of spatially offset positions comprises positions corresponding to the identified sequence of test images.

28.(Original) A computer-readable medium having computer-executable instructions for performing a method of identifying spatially offset display positions for low resolution sub-frames, the sub-frames generating the appearance of a high resolution image when displayed by a display device at the identified positions, comprising:

identifying a plurality of different combinations of the display positions; and
analyzing each of the combinations to identify a combination of display positions that minimizes an effect of defective display pixels of the display device on a human visual system.

29.(Original) The computer-readable medium of claim 28, wherein the method further comprises:

generating a plurality of sequences of test images, each sequence of test images corresponding to a different combination of display positions.

30.(Original) The computer-readable medium of claim 29, wherein the method further comprises:

filtering each sequence of test images with a filter based on human visual system (HVS) spatio-temporal characteristics.

31.(Original) The computer-readable medium of claim 30, wherein the method further comprises:

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identifying a sequence of test images from the plurality of sequences of test images that has the smallest impact on the human visual system.

32.(Original) The computer-readable medium of claim 31, wherein the identified combination of display positions comprises positions corresponding to the identified sequence of test images.